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Book review

Next

Michael Crichton

New York: Harper Collins, 2006

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Michael Crichton's latest novel *Next* (2006) is his third about genomics. Yet, whereas *Jurassic Park* (and its sequel *The lost world*) contained stories about sequencing, reconstructing and revivifying the genomes of (extinct) animals, *Next* analyses the impact of genomics in the biomedical sphere: its consequences for human life (health, labour, sexuality, family life).

At first sight, *Next* is a fairly confusing novel.² As Michael Crichton explains in an interview, this was deliberate; like a genome, the novel picks up bit and pieces of information as it evolves.³ It is set at various levels. On the surface, it seems to take the logic of genetic determinism to its very extreme, to the point of utter absurdity. Sub-plots about, for example, the hunt for the novelty-seeking gene, transgenic chimpanzees and parrots who can reason and talk, an ambulance chasing the daughter and grandson of a man from whose tissue UCLA developed a profitable cell line, must be regarded as caricature or persiflage. Apparently, Crichton seems to argue, this is how the "illiterate" (in which he includes journalists, lawyers, patent attorneys and judges) tend to view genomics.⁴ Bizarre and at times soap-opera-like stories are intersected, however, with reflections on what genomics (notably the Human Genome Project) really amounts to. In this manner, *Next* apparently has the intention of demonstrating the enormous tension between the kinds of insights genomics research is actually producing and the way they are represented in the public realm.

Gene hunting features prominently in the novel. A number of "genes for" - genes that supposedly determine behavioural characteristics - are central to the plot. These include not only well-trodden examples (such as genes for intelligence, alcoholism or sexual orientation) but also the sociability gene, the novelty-seeking gene, the maturity gene and the infidelity gene. The most prominent gene hunter in the book is Dr. Robert Bellarmino, head of the National Institutes of Health (NIH), top scientist but also devout Christian, politically skilled and media savvy⁵ who, as a referee, systematically rejects funding applications from rival teams, who deprives his favourite post-doc of first-authorship, and whose research on the novelty-seeking gene incites him to visit amusement parks in order to collect genetic materials from visitors. As a consequence of Bellarmino's publications (fifty papers a year), lawyers are considering the option to use screening for the novelty-seeking gene as a mitigating circumstance on behalf of clients who happen to engage in risky lifestyles, or to subject former partners to genetic screening in the context of custody cases. Meanwhile, treatment of drug addicts with sprays containing an experimental virus that carries the maturity gene will solve their drug problem, but also causes premature ageing.

In most of these cases, there is some connection with serious research. In 1996, for example, a research group lead by Dean Hamer confirmed that variation in the length of the gene for the dopamine D4 receptor correlated with “novelty seeking”, that is: extravert and thrill-seeking behaviour.⁶ Yet, the small print in Hamer’s *Nature Genetics* study was overlooked: “this was far from the gene for bungee jumping, as some newspapers reported”.⁷ Likewise, research has been published on the sociability gene, but it concerns solitary versus group feeding in *C. elegans*⁸ and it is far from evident how – if at all – such a finding could be extrapolated to the intricacies of human behaviour. Crichton portrays prominent researchers like Bellarmino as people who, in a rather cynical manner, “take advantage of the public’s lack of knowledge about how genes actually operate. No single gene controls any behavioural trait” (p.158). Bellarmino represents a new generation of highly visible and highly influential scientists, people who “sit on the boards of private companies, and are in a race to identify genes they can patent for their own profit” (p.158).

However, these gene hunters and the simplistic view of genomics they convey are counter-pointed by a number of (usually less visible and affluent) critics, such as one Professor William Garfield of the University of Minnesota who, lecturing before a group of congressmen, claims that “despite what you hear, nobody has ever proven a single gene causes a single human behavioural trait [...] The interaction of genes and environment is just too complex” (p.211). Garfield argues that publications on new “genes for” are often misrepresented; they refer to statistical association, not causal relationships. There is, for instance, no single gene that accounts for alcoholism. The public readily believes that genes cause behaviour, but the actual relationship between genes and environment is very complicated, and scientists have little understanding of how genes work. “[T]here is no general agreement on what a gene is,” says Garfield. “[Among scientists] there is no single agreed-upon definition of what a gene is” (p.212).⁹

In his briefing, Garfield also mentions how scientists were initially startled to find such a small number of protein-coding genes on the human genome (~23,000). “After all, a lowly earthworm has 20,000 genes. How, then, could you explain the huge difference in complexity between the two? That problem vanished as scientists began to study the interactions among genes [and began to move into] ‘epigenic studies’, which look at exactly how genes interact with the environment to produce the individual that we see” (p.213). Yet, this briefing more or less stands out as an intellectual intermezzo, comparable to the monologues of Ian Malcolm in *Jurassic Park* and *The Lost World*. As a rule, Crichton prefers to rely on his strategy of extrapolation *ad absurdum*, fleshing out what genetic determinism may lead to (if it is really taken seriously) in various real-life settings involving love, family life and divorce.

A number of other normative issues – concerning scientific authorship, for example, and the various threats commercialisation presents to the ethos of science through gene patenting – are also addressed. Because of these developments, research findings are increasingly disseminated through press conferences and press release, rather than through academic journals.¹⁰ According to Crichton, university groups are increasingly reluctant to publish their work in the conventional manner. Moreover, even prominent academic journals can no longer be trusted: “Remember that the

journal *Science* is a big enterprise – 115 people work on that magazine. Yet, gross instances of fraud, including photographs altered with Adobe Photoshop, often go undetected” (p.62). Indeed, “even Francis Collins, the head of NIH’s Human Genome project, was listed as co-author on five faked papers that had to be withdrawn” (p.62) - which, in fact, is true. Three million researchers are working in this field and this implies that stakes are high, says Crichton. Traditional scholarly mechanisms can no longer be trusted to cope effectively with the consequences of commercialisation. And indeed, in prominent journals such as *Science*, embarrassing retractions (because of fraud or premature and unconfirmed results) have become part of daily practice.

Commercialisation affects not only the research community, but also the outside world. Patients are asked to sign informed consent forms to sell their tissue, and, should successful pharmaceuticals be developed on the basis of the resulting cell-lines, this may lead to more or less absurd disputes over property rights. In addition, body materials are obtained illegally from deceased persons. Young women (including Bellarmino’s daughter) are enticed to inject drugs and hormones into their bodies in order to stimulate their ovaries and sell their eggs - perhaps a reference to the case of Woo-Suk Hwang, who is actually mentioned several times in Crichton’s novel - although, in this case, the young women involved receive money which they use to buy breast implants. While in principle some of these issues are real enough, they clearly suffer from Crichton’s strategy of exaggeration.¹¹

Crichton’s ultimate target, however, is gene patenting, the heart of the matter, and a practice he considers to be absurd. Moreover, it is here that normative concerns over commercialisation most clearly converge with epistemological issues (the reductionism-versus-complexity debate). According to Crichton, our growing awareness of the complex relationships between genes and disease, and between genes and behaviour, renders the very idea of patenting genes absurd, not only because genes are facts of nature rather than inventions, but also because one-to-one relationships between genes and function are the exception rather than the rule. Therefore, genomics research has made ideas about owning genes and manipulating genomes (notably in the context of behavioural transformation) quite implausible. Gene patenting, and the philosophy of genetic determinism that inspired and legitimised this practice, is at the root of most of the soap-like absurdities Crichton stages in his novel. Mastery over (human) nature has (at least) two meanings: ownership (of genes) and manipulation (by adding or deleting single genes). Both are undermined by our growing awareness of the human genome’s complexities. Yet, in order to make this point more successfully, Crichton should perhaps have written a novel containing somewhat less farce.

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² “Crichton tries to address every aspect of the biotechnology craze at once, giving the book too many simultaneous plotlines to follow” (M. Goldman. Calamity gene. *Nature* 2007; 445: 819-820, p.819).

³ “I wanted [the book] to be in a way analogous to the genome. The genome accumulates bits and pieces of genetic material over time. It gets viruses. They get incorporated. So I started incorporating a fair number of things ... true stories that I just stick in the book.” Michael Crichton speaking on *The Charlie Rose Show*, 19 February 2007. Transcript available at <http://www.michaelcrichton.net/charlierose-021907.pdf>.

⁴ “The courts are incompetent [...] because they are technically illiterate” (from the book under review, p.56).

⁵ My impression is that Bellarmino represents a mixture of Craig Venter and Francis Collins.

⁶ J. Benjamin et al. Population and familial association between the D4 dopamine receptor gene and measures of Novelty Seeking. *Nature Genetics* 1996; 12: 81-84; and see D. Hamer and P. Copeland. 1998. *Living with our genes*. New York: Doubleday.

⁷ K. Davies, 2001/2002. *Cracking the genome. Inside the race to unlock human DNA*. Baltimore and London: John Hopkins University Press, p.233; and see A. Paterson, G. Sunohara, J. Kennedy.

Dopamine D4 receptor gene: novelty or nonsense? *Neuropsychopharmacology* 1999; 2:3-16.

⁸ On the “sociability gene” see, for instance: *Nature* 1998; 395: 327.

⁹ See for a philosophical version of this debate: J. Dupré, *Understanding contemporary genomics. Perspectives on Science* 2004; 12 (3): 320-338.

¹⁰ The 2000 press conference, rather premature and hastily contrived (Davies, *op. cit.*, note 7, p.xv), was, in fact, an example of this policy.

¹¹ Goldman, *op. cit.*, note 1, pp.819-820.